

Appendix 4C
OU-4b 2019-2020 Data Quality Summary, Laboratory, and Validation
Reports

Atlantic Richfield Company

wood.

Appendix 4C-1
2019-2020 OU-4b Data Quality Summary Report

APPENDIX 4C-1

Data Quality Summary Report

2019 – 2020 Operable Unit 4b Remedial Investigation

1.0 Data Quality Summary

This summary documents that the quality of the analytical data for soils collected from the Operable Unit 4b (OU-4b) area in conjunction with the overall *Combined Operable Unit-4b, Unit-5, and Unit-6 Remedial Investigation Field Sampling and Analysis Plan* (Wood, 2019) (FSAP) generally met the data quality objectives (DQOs) set forth in the QAPP. Completed data quality assurance reviews (i.e., data verification and data validation) of the reported laboratory chemical results were conducted and documented by a third-party validator, Environmental Standards, Inc. Data quality has been evaluated in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). The qualitative and quantitative criteria for PARCCs, often referred to as data quality indicators (DQIs), are presented in the approved Site-Wide Quality Assurance Project Plan, update version 5.1 (QAPP) for the Anaconda Copper Mine Site (ARC, 2018) and are the basis of the data quality assurance reviews.

All related laboratory reports and respective chemical data validation/verification reports are included in Appendix 4C-2 and Appendix 4C-3, respectively. A database export of reported results is provided in Appendix 4C-4. Summary data tables have been prepared based on data review results to support evaluation of overall data quality and availability for use in site characterization, risk assessment, or other remedial evaluations and are provided in Appendix 4D of the Remedial Investigation Report.

1.1 Data Quality Assurance Reviews

Data quality assurance reviews were conducted using a two-tiered approach for the OU-4b investigation samples. The first tier, data verification, was limited to evaluation of the reported quality control (QC) results provided in the Level II laboratory data report consistent with the QAPP with respect to the project DQIs and was completed for 100 percent of the overall chemical data set for the OU-4b soil samples. Data verification provided evaluation of the results for holding times, field and laboratory blank samples, laboratory control samples, matrix spike samples, matrix spike duplicate/laboratory duplicate samples, field duplicate samples, and quantitation below the laboratory reporting limit (RL), using the QC criteria specified in the QAPP. The second tier, data validation, was performed on a subset of the reported laboratory results, approximately 23 percent, for the overall OU-4b soil investigation samples using the more extensive laboratory data packages, or Level IV laboratory reports, and included the same review elements as data verification, as well as a review of instrument calibration records, laboratory performance criteria, raw data, and quantitative determinations using guidance from the National Functional Guidelines (U.S. EPA, 1994).

1.2 Data Acceptability

The overall quality of this data set was acceptable for supporting project decisions related to the referenced investigation areas for the Anaconda Copper Mine Site. More than 99 percent of the planned data was completed, and approximately 91 percent of the reported data was reported without data limitation, or qualification. As shown in Table 4C1-1, the qualified sample results do not indicate a problem that adversely affected the usability of the data for evaluation. The final data qualifiers, assigned to a limited number of sample results through the course of data verification and validation, indicate that some results are estimated but are useable as quantitative data, as reported. A majority of the J-qualified results simply imply that the result is below the method RL. In general, J-, UJ and other qualified results are available for use for evaluation of potential releases, the nature and extent of contamination, and

estimating potentially associated human health and ecological risks. Less than one percent of the data were qualified as rejected, nor deemed unusable. The remainder of the data collected are deemed useable for data evaluation purposes.

2.0 Data Quality Results

A total of 212 samples, including required field QC samples, were collected as summarized in Section 4.3.2 of the Remedial Investigation Report. The samples were submitted under proper chain-of-custody to the respective laboratories for testing. Laboratory deliverables were verified for completeness and compliance with project documents. Data quality assurance reviews for the chemical data analyzed and reported by Nevada certified TestAmerica and ACZ laboratories were completed by Environmental Standards, Inc. in accordance with the QAPP.

During data verification and validation activities, individual data points were qualified, if necessary, by applying flags (i.e., data validation flags) as an indication of data availability and usefulness for subsequent data evaluation and site decisions. Respective laboratory method flags and data validation flags were reconciled to a single “final data qualifier” by the third-party validator. All laboratory flags, data validation flags, and final qualifiers are retained with the respective sample results in the project database. Final data warranting qualification are discussed in the subsections below and a statistical summary of the overall data quality results, for both unqualified and qualified data, is provided in Table 4C1-1. All final sample results are presented in the data summary tables provided in Appendix 4D.

2.1 Laboratory Data Review Results

Laboratory methods were employed as referenced in the FSAP (Wood, 2019). The analytical procedures include the required quality control measures incorporated during the testing process, and together with the QAPP, are the basis for the DQIs used for data verification and validation.

- Most holding times presented in the QAPP were met by the laboratories. Sample results for nitrate/nitrite were qualified as estimated (i.e., flagged as “J”) or as rejected (i.e., flagged as “R”) based on holding time excursion due to the short holding times for testing. Nineteen results for nitrate/nitrite are not available for evaluation purposes.
- An appropriate laboratory control samples (LCS) was analyzed with each batch of environmental samples and results reported as percent recovery for each laboratory method in accordance with laboratory procedures. Few results were qualified based on noncompliance with the DQIs for the LCS, and all qualified results suggested a high bias indicating a conservative estimate for some Radium-226 and boron results in the MWMP leachate.
- Nine matrix spike/matrix spike duplicate (MS/MSD) samples were submitted and reported as calculated percent recoveries for each applicable laboratory method, along with other random lab selected samples, satisfying the minimum requirement (five percent of primary samples) outlined in the QAPP. Approximately six percent of the sample results were qualified as estimated (i.e., flagged as “J” or “UJ”) on the basis of aberrant MS/MSDs. Data most often qualified due to of aberrant MS/MSD exhibited a low bias in qualified results for antimony and high bias in qualified results for potassium in soil samples. Other commonly qualified results included barium, strontium, mercury, and weak acid dissociable cyanide.
- Laboratory blanks, consisting of contaminant-free water, were prepared and analyzed in accordance with laboratory standard operating procedures (SOPs) to monitor for potential contamination of laboratory equipment, reagents and sample containers and were reported with the respective sample results for each analytical batch. Less than two percent of the reported

samples results were qualified (i.e., flagged as “UJ”) due to associated detections in the laboratory method blanks, including detections below the RL. Lab blank contamination was most often associated with boron and Radium-226 analyses. The limited occurrence of data qualification should not have a primary influence on the results, and the reported results are considered useful as qualified.

- All calibration standards, procedural check solutions, internal standards and tracer solutions, dilutions, and calculations reviewed during data validation were found to comply with method procedures. Compliance of these laboratory processes with method requirements contributes to the acceptable quality of the data.

Laboratory reports are presented in Appendix 4C-2. Analytical results, including the qualified results described above, are summarized in Appendix 4D, and are detailed in the respective data validation reports provided in Appendix 4C-3.

2.2 Field Data Review Results

Approved SOPs were used for sample collection and sample testing activities. The SOPs were presented in the FSAP for this investigation which included the requirements for collecting field QC samples using the guidance provided in the QAPP. Field QC samples collected for this investigation included field blanks, equipment blanks, and field duplicate samples. Evaluation of the field QC sample results was based on the DQIs presented in the QAPP for applicable methods and included with the data verification and validation reporting.

- Eighteen soil field duplicate (FD) samples were collected satisfying the minimum requirement (10 percent of primary field samples) set forth in the QAPP. A subset of ten FD samples were analyzed from the meteoric water mobility procedure (MWMP). The precision results for FD samples are summarized in Tables 4C1-2a and 4C1-2b, for soils and MWMP leachates. The calculated relative percent difference (RPD) and replicate error ratio (RER) met the analyte-specific criteria established in the QAPP for most target analytes. Less than one percent of the data was qualified on the basis of aberrant field duplicate results, and these data are considered estimates (i.e., flagged as “J”). Qualified results occurred most often for mercury and uranium, including concentrations below the RL. The reported concentrations are considered useful as qualified.
- Nine field blank (FB) samples and nine equipment blank (EB) samples, consisting of contaminant-free water, were collected in accordance with field SOPs satisfying the minimum requirement (five percent of primary samples) set forth in the QAPP. Table 4C1-3 summarizes results in blank samples collected in the field. No results were qualified on the basis of field blank contamination. The limited detections reported in these blank samples indicate field sampling procedures were effective in preventing cross contamination during sampling.

2.3 Data Completeness

All samples submitted for testing were completed as planned. As summarized and presented in this report, approximately 91 percent of the data reported are acceptable without any qualification (i.e., categorized as fully usable quantitative data). Data categorized as “usable as qualified” are also considered quantitative data and make up an additional 8 percent of the samples from the 2019-2020 OU-4b soil data set. Less than one percent of reported results were deemed “unusable” in terms of evaluation of the PARCCs, and the completeness goal (90 percent) was achieved for this subset of investigation activities.

3.0 References

- Atlantic Richfield Company (ARC), 2018. Site-Wide Quality Assurance Project Plan, Update Version 5.1, Anaconda Copper Mine Site, Yerington, Nevada. September 5.
- Wood, 2019. Combined Operable Unit-4b, Unit-5, and Unit-6 Remedial Investigation Field Sampling and Analysis Plan, Anaconda Copper Mine Site, Yerington, Nevada. Prepared for Atlantic Richfield Company. May 7.
- U.S. EPA, 1994, Contract Laboratory Program National Functional Guidelines for Inorganics Data Review. Office of Emergency and Remedial Response, Washington, DC. February.



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Tables



Appendix 4C-1, Table 4C1-1
Summary of Analytical Data Quality by Method - OU-4b 2019-2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

Sampling and Analyses				Summary of Data Qualification							Completeness and Data Usability			
Method	Parameter	Planned Samples	Completed Samples	Total Results Planned	Total Results Obtained	Results Not Qualified	Detections Qualified Estimated Below RL	Detections Qualified Estimated DQI Outliers	Non-detects Qualified Estimated DQI Outliers	Results Qualified Rejected DQI Outliers	Overall Complete Data ⁽¹⁾	Data Qualified Due to DQI Outliers	Overall Usable Data ⁽²⁾	Data Quality Comments
EPA 6010B	Total ICP Metals ⁽³⁾	194	194	2,328	2,328	1,871	217	239	1	0	100%	10%	100%	Estimated data most often occurred due to MS/MSD recoveries
EPA 6020/6020A	Total ICP-MS Metals ⁽⁴⁾	194	194	3,686	3,686	3,108	347	155	76	0	100%	6.3%	100%	Estimated data most often occurred due to MS/MSD recoveries
EPA 7471A	Total Mercury	194	194	194	194	126	4	62	2	0	100%	33%	100%	Estimated data most often occurred due to MS/MSD recoveries
EPA 901.1Mod	Radium-226	194	194	194	194	149	33	12	0	0	100%	6%	100%	Estimated data most often occurred due to lab duplicate imprecision.
EPA 901.1Mod	Radium-228	194	194	194	194	125	68	1	0	0	100%	1%	100%	Most estimated data are below the RL.
EPA 6010D	MWMP ICP Metals	101	101	1,313	1,313	912	185	71	145	0	100%	16%	100%	Estimated data most often occurred due to lab blank contamination near or below the RL, or MS/MSD recoveries
EPA 6020B	MWMP ICP-MS Metals	101	101	1,818	1,818	1478	247	62	31	0	100%	5%	100%	Estimated data most often occurred due to lab duplicate imprecision.
EPA 7470A	MWMP Mercury	101	101	101	101	90	11	0	0	0	100%	0%	100%	All estimated data are below the RL.
EPA 903.1Mod	MWMP Radium-226	101	101	101	101	41	0	19	41	0	100%	59%	100%	Estimated data most often occurred due to lab blank contamination near or below the RL
EPA 9320	MWMP Radium-228	101	101	101	101	99	0	1	1	0	100%	2%	100%	Most estimated data are below the RL.
SM 4500-Cl/ASTM D516	MWMP Chloride, Sulfate	101	101	202	202	192	9	0	1	0	100%	0%	100%	Most estimated data are below the RL.
EPA 351.3	MWMP Nitrate+Nitrite (N) ⁵	101	101	101	101	39	29	14	0	19	81%	33%	81%	Estimated and rejected data occurred due to missed holding time.
SM 2320B	MWMP Alkalinity (as CaCO ₃) ⁶	101	101	101	101	96	4	1	0	0	100%	1%	100%	All estimated data are near or below the RL.
SM 2540C	MWMP Total Dissolved Solids	101	101	101	101	75	26	0	0	0	100%	0%	100%	Estimated data occurred due to missed holding time.
SM 4500-CN	MWMP WAD Cyanide	101	101	101	101	66	1	0	34	0	100%	34%	100%	Estimated data most often occurred due to low MS/MSD and below the RL
SM 4500-F	MWMP Fluoride	101	101	101	101	52	21	25	3	0	100%	28%	100%	Most estimated data are below the RL.
EPA 351.2	MWMP Total Kjeldahl Nitrogen	101	101	101	101	82	19	0	0	0	100%	0%	100%	All estimated data are below the RL.
Total 2019 - 2020 OU-4b Soil Sampling Program				10,838	10,838	8,601	1,221	662	335	19	99.8%	9%	99%	Overall, data meet QAPP requirements for completenss.

Note(s)

1. Percent completeness calculated based on number of non-rejected results out of total planned results for primary and field duplicate samples only.
2. Percent usability calculated based on number of non-rejected results out of total results obtained for primary and field duplicate samples only.
3. Metals include aluminum, boron, calcium, iron, lithium, magnesium, phosphorus, potassium, sodium, strontium, tin, and titanium.
4. Metals include antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, thorium, uranium, vanadium, and zinc.
5. Laboratory reported nitrate and nitrite with total combined concentration.
6. Laboratory reported total, bicarbonate, carbonate, and hydroxide forms of alkalinity.

Abbreviation(s)

% = percent
CaCO₃ = calcium carbonate
DQI = data quality indicators
EPA = Environmental Protection Agency
ICP = inductively coupled plasma
ICP-MS = inductively coupled plasma-mass spectrometry
MWMP = meteoric water mobility procedure
N = Nitrogen
RL = reporting limit
SM = Standard Methods for Water and Wastewater
WAD = weak acid dissociable

Appendix 4C-1, Table 4C1-2a
Summary of Soil Field Duplicate Results - OU-4b 2019 - 2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

	Location ID Depth (ft bgs) Sample Date Sample Type	STSB-02 6-15 12/17/2019 N	STSB-02 6-15 12/17/2019 FD		STSB-03 0-0.5 12/10/2019 N	STSB-03 0-0.5 12/10/2019 FD		STSB-04 15-25 12/9/2019 N	STSB-04 15-25 12/9/2019 FD		STSB-05 35-45 12/4/2019 N	STSB-05 35-45 12/4/2019 FD		STSB-06 0.5-3 12/5/2019 N	STSB-06 0.5-3 12/5/2019 FD		STSB-06 15-25 12/5/2019 N	STSB-06 15-25 12/5/2019 FD	
				RPD ¹			RPD ¹			RPD ¹			RPD ¹			RPD ¹			RPD ¹
Total Metals	DQI Outliers																		
Aluminum (mg/Kg)	0%	8300	6600	23%	6600	7300	10%	4500	4600	2%	6000	5900	2%	5500	5800	5%	5000	5500	10%
Antimony (mg/Kg)	6%	< 0.29	< 0.29	NC	2.4	1.9	23%	0.39	0.69	56%	< 0.30	< 0.29	NC	< 0.28	< 0.28	NC	< 0.28	0.28	NC
Arsenic (mg/Kg)	6%	1.4	0.98	35%	8.9	5.8	42%	1.4	1.5	7%	1.1	1.4	24%	1.2	1.3	8%	1.3	1.3	0%
Barium (mg/Kg)	6%	45	37	20%	30	31	3%	36	37	3%	33	49	39%	28	30	7%	43	45	5%
Beryllium (mg/Kg)	6%	0.45	0.26	54%	0.17	0.16	6%	0.17	< 0.16	6%	< 0.17	0.18	6%	0.16	< 0.16	0%	< 0.16	0.22	32%
Boron (mg/Kg)	0%	< 2.7	< 2.7	NC	< 2.7	< 2.6	NC	< 2.6	< 2.6	NC	< 2.8	< 2.7	NC	< 2.6	< 2.6	NC	< 2.6	< 2.6	NC
Cadmium (mg/Kg)	0%	< 0.27	< 0.27	NC	< 0.27	< 0.26	NC	< 0.26	< 0.26	NC	< 0.28	< 0.27	NC	< 0.26	< 0.26	NC	< 0.26	< 0.26	NC
Calcium (mg/Kg)	0%	5500	4700	16%	2500	3200	25%	3500	3500	0%	3500	4600	27%	4100	4200	2%	4500	5300	16%
Chromium (mg/Kg)	6%	7.8	6.8	14%	4.0	5.1	24%	6.5	6.3	3%	6.0	7.0	15%	5.3	5.0	6%	7.9	8.7	10%
Cobalt (mg/Kg)	6%	4.7	4.6	2%	3.4	3.4	0%	4.2	4.1	2%	3.2	4.2	27%	4.9	4.9	0%	3.6	3.7	3%
Copper (mg/Kg)	0%	1000	1200	18%	750	520	36%	1200	1200	0%	550	780	35%	940	850	10%	1000	1000	0%
Iron (mg/Kg)	0%	17000	19000	11%	13000	13000	0%	12000	12000	0%	10000	12000	18%	11000	11000	0%	10000	11000	10%
Lead (mg/Kg)	0%	1.2	1.5	22%	2.5	2.1	17%	1.4	1.4	0%	1.1	1.4	24%	1.3	1.2	8%	1.3	1.4	7%
Lithium (mg/Kg)	0%	5.2	5.4	4%	6.0	6.4	6%	3.5	3.4	3%	4.4	4.6	4%	4.9	4.3	13%	4.5	4.4	2%
Magnesium (mg/Kg)	0%	6500	5600	15%	5300	6200	16%	4000	4100	2%	6800	5500	21%	5500	5800	5%	5000	5300	6%
Manganese (mg/Kg)	6%	63	63	0%	28	32	13%	66	65	2%	62	73	16%	69	66	4%	62	67	8%
Mercury (mg/Kg)	22%	0.052	0.052	0%	0.33	0.36	9%	0.04	0.04	0%	0.046	0.070	41%	0.013	0.039	100%	0.035	0.089	87%
Molybdenum (mg/Kg)	17%	1.3	2.2	51%	14	4.7	99%	2.7	2.6	4%	1.7	2.1	21%	1.4	1.4	0%	2.4	2.9	19%
Nickel (mg/Kg)	6%	9.8	8.4	15%	4.6	4.8	4%	6.5	6.4	2%	6.6	7.6	14%	7.3	7.9	8%	7.4	7.8	5%
Phosphorus (mg/Kg)	0%	800	750	6%	370	400	8%	590	580	2%	620	650	5%	630	680	8%	550	610	10%
Potassium (mg/Kg)	11%	1700	1400	19%	400	470	16%	1100	1200	9%	880	1200	31%	1200	1200	0%	1600	1800	12%
Selenium (mg/Kg)	11%	2.0	1.8	11%	5	2.4	70%	2.0	2.0	0%	1.3	1.6	21%	1.6	1.6	0%	1.6	1.7	6%
Silver (mg/Kg)	0%	0.12	0.16	29%	< 0.11	< 0.11	NC	0.13	0.14	7%	< 0.11	< 0.11	NC	0.11	0.11	0%	0.12	0.16	29%
Sodium (mg/Kg)	0%	53	43	21%	79	70	12%	48	55	14%	75	99	28%	36	35	3%	64	78	20%
Strontium (mg/Kg)	17%	34	21	47%	40	41	2%	25	25	0%	20	31	43%	27	26	4%	18	19	5%
Thallium (mg/Kg)	0%	< 0.27	< 0.27	NC	< 0.27	< 0.26	NC	< 0.26	< 0.26	NC	< 0.28	< 0.27	NC	< 0.26	< 0.26	NC	< 0.26	< 0.26	NC
Thorium (mg/Kg)	11%	6.6	6.2	6%	5.4	5.0	8%	6.3	6.5	3%	8.1	6.3	25%	6.4	6.7	5%	5.1	6.1	18%
Tin (mg/Kg)	0%	< 5.4	< 5.3	NC	< 5.4	31	31%	< 5.2	< 5.2	NC	< 5.5	< 5.4	NC	< 5.2	< 5.2	NC	< 5.2	< 5.2	NC
Titanium (mg/Kg)	6%	670	460	37%	160	170	6%	210	230	9%	300	410	31%	490	580	17%	330	370	11%
Uranium (mg/Kg)	22%	4.2	5.9	34%	1.6	1.7	6%	2.0	1.9	5%	1.5	1.1	31%	1.2	1.4	15%	1.7	1.8	6%
Vanadium (mg/Kg)	0%	24	18	29%	20	24	18%	15	15	0%	15	18	18%	20	21	5%	17	18	6%
Zinc (mg/Kg)	6%	23	26	12%	6.1	6.5	6%	12	12	0%	11	13	17%	13	14	7%	16	17	6%
Radionuclides																			
Radium-226 (pCi/g)	0%	0.735 +/-0.192	1.13 +/-0.270	1.2	1.41 +/-0.270	1.47 +/-0.249	0.2	1.27 +/-0.259	1.58 +/-0.315	0.8	1.08 +/-0.227	1.08 +/-0.247	0	1.31 +/-0.254	1.07 +/-0.241	0.7	1.22 +/-0.239	1.29 +/-0.305	0.2
Radium-228 (pCi/g)	0%	1.23 +/-0.283	1.24 +/-0.377	0.02	0.975 +/-0.215	0.593 +/-0.332	1.0	1.29 +/-0.292	1.34 +/-0.313	0.1	1.19 +/-0.273	1.04 +/-0.330	0.4	1.19 +/-0.245	1.03 +/-0.275	0.4	0.622 +/-0.294	1.27 +/-0.445	1.2

Appendix 4C-1, Table 4C1-2a
Summary of Soil Field Duplicate Results - OU-4b 2019 - 2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

Location ID Depth (ft bgs) Sample Date Sample Type		STSB-07 0.5-3 1/8/2020 N	STSB-07 0.5-3 1/8/2020 FD	RPD ¹	STSB-09 0-0.5 1/8/2020 N	STSB-09 0-0.5 1/8/2020 FD	RPD ¹	STSB-11 0.5-3 12/18/2019 N	STSB-11 0.5-3 12/18/2019 FD	RPD ¹	STSB-12 6-15 1/8/2020 N	STSB-12 6-15 1/8/2020 FD	RPD ¹	STSB-16 3-6 1/7/2020 N	STSB-16 3-6 1/7/2020 FD	RPD ¹	STSB-18 6-15 1/7/2020 N	STSB-18 6-15 1/7/2020 FD	RPD ¹
Total Metals	DQI Outliers																		
Aluminum (mg/Kg)	0%	6900	7300	6%	8500	6500	27%	5000	4900	2%	7100	8100	13%	6600	6800	3%	8100	9300	14%
Antimony (mg/Kg)	6%	0.39	0.4	3%	0.55	0.47	16%	0.52	0.42	21%	0.31	0.3	3%	< 0.29	< 0.29	NC	0.51	0.31	49%
Arsenic (mg/Kg)	6%	6.0	5.6	7%	4.2	3.7	13%	1.5	1.4	7%	2.4	2.8	15%	1.8	2.0	11%	1.6	1.8	12%
Barium (mg/Kg)	6%	40	44	10%	28	28	0%	40	39	3%	33	33	0%	42	44	5%	49	55	12%
Beryllium (mg/Kg)	6%	0.2	< 0.16	22%	< 0.16	0.19	17%	< 0.16	< 0.16	NC	0.23	0.31	30%	0.18	0.2	11%	0.32	0.32	0%
Boron (mg/Kg)	0%	< 2.6	< 2.6	NC	< 2.7	< 2.7	NC	< 2.6	< 2.6	NC	< 2.7	< 2.7	NC	< 2.7	< 2.7	NC	< 2.9	< 2.9	NC
Cadmium (mg/Kg)	0%	< 0.26	< 0.26	NC	< 0.27	< 0.27	NC	< 0.26	< 0.26	NC	< 0.27	< 0.27	NC	< 0.27	< 0.27	NC	< 0.29	< 0.29	NC
Calcium (mg/Kg)	0%	4300	4900	13%	4200	3400	21%	3100	3000	3%	4900	4800	2%	4700	4500	4%	5000	5200	4%
Chromium (mg/Kg)	6%	9.5	10	5%	6.8	5.6	19%	6.4	6.3	2%	16	20	22%	19	21	10%	9.6	12	22%
Cobalt (mg/Kg)	6%	2.6	2.7	4%	3.1	3.5	12%	2.3	2.2	4%	3.0	3.4	13%	3.0	3.1	3%	4.2	4.5	7%
Copper (mg/Kg)	0%	360	350	3%	470	460	2%	370	350	6%	940	1200	24%	390	390	0%	1000	840	17%
Iron (mg/Kg)	0%	17000	18000	6%	14000	11000	24%	13000	13000	0%	9300	10000	7%	17000	18000	6%	12000	13000	8%
Lead (mg/Kg)	0%	3.3	3.0	10%	2.5	2.3	8%	1.5	1.5	0%	0.89	0.98	10%	1.6	1.7	6%	1.5	1.6	6%
Lithium (mg/Kg)	0%	3.6	3.8	5%	3	< 3.1	3%	3	< 2.9	3%	< 3.0	3	0%	3	3.6	18%	4.5	5.2	14%
Magnesium (mg/Kg)	0%	5900	6300	7%	6800	5000	31%	4500	4300	5%	6100	6400	5%	5600	5700	2%	6200	6800	9%
Manganese (mg/Kg)	6%	39	43	10%	51	47	8%	39	38	3%	45	48	6%	48	48	0%	55	64	15%
Mercury (mg/Kg)	22%	0.19	0.16	17%	0.15	0.15	0%	0.036	0.046	24%	0.12	0.11	9%	0.071	0.022	105%	0.077	0.071	8%
Molybdenum (mg/Kg)	17%	5.6	5.4	4%	2.1	1.9	10%	3.6	3.6	0%	4.4	2.8	44%	3.1	3.1	0%	2.4	2.8	15%
Nickel (mg/Kg)	6%	6.1	6.7	9%	7.3	6.4	13%	5.8	5.7	2%	6.8	6.9	1%	7.1	7.3	3%	8.6	9.6	11%
Phosphorus (mg/Kg)	0%	1200	1300	8%	780	620	23%	600	580	3%	1500	2000	29%	1200	1300	8%	770	880	13%
Potassium (mg/Kg)	11%	1600	1600	0%	1400	1200	15%	1200	1300	8%	1500	1600	6%	1800	1800	0%	1600	1800	12%
Selenium (mg/Kg)	11%	2.6	2.5	4%	2.3	2.0	14%	1.5	1.5	0%	1.7	1.7	0%	1.6	1.6	0%	2.0	2.1	5%
Silver (mg/Kg)	0%	0.11	0.12	9%	< 0.11	< 0.11	NC	0.13	0.13	0%	0.13	0.16	21%	0.12	0.13	8%	< 0.11	< 0.12	NC
Sodium (mg/Kg)	0%	120	100	18%	190	150	24%	61	60	2%	56	62	10%	< 35	< 35	NC	68	83	20%
Strontium (mg/Kg)	17%	51	51	0%	54	44	20%	30	31	3%	37	37	0%	26	24	8%	29	35	19%
Thallium (mg/Kg)	0%	< 0.26	< 0.26	NC	< 0.27	< 0.27	NC	< 0.26	< 0.26	NC	< 0.27	< 0.27	NC	< 0.27	< 0.27	NC	< 0.29	< 0.29	NC
Thorium (mg/Kg)	11%	21	26	21%	6.7	7.6	13%	5.5	5.3	4%	10	5.7	55%	8.3	8.5	2%	10	5.8	53%
Tin (mg/Kg)	0%	25	25	0%	< 5.4	< 5.5	NC	< 5.2	< 5.2	NC	< 5.4	< 5.4	NC	< 5.4	< 5.4	NC	< 5.7	< 5.8	NC
Titanium (mg/Kg)	6%	530	570	7%	420	340	21%	320	320	0%	490	470	4%	360	380	5%	440	530	19%
Uranium (mg/Kg)	22%	7	10	35%	2.2	3.6	48%	0.88	0.87	1%	25	24	4%	7.0	6.3	11%	7.5	1.7	126%
Vanadium (mg/Kg)	0%	22	23	4%	17	15	13%	19	19	0%	18	20	11%	34	36	6%	22	27	20%
Zinc (mg/Kg)	6%	10	11	10%	11	15	31%	13	11	17%	11	12	9%	16	17	6%	16	17	6%
Radionuclides																			
Radium-226 (pCi/g)	0%	2.02 +/-0.354	1.87 +/-0.358	0.3	4.78 +/-0.626	4.64 +/-0.575	0.2	1.09 +/-0.204	1.49 +/-0.303	1.1	0.710 +/-0.199	0.879 +/-0.203	0.6	1.51 +/-0.330	0.994 +/-0.190	1.4	1.60 +/-0.351	1.38 +/-0.280	0.5
Radium-228 (pCi/g)	0%	3.42 +/-0.552	3.47 +/-0.602	0.1	1.31 +/-0.415	0.900 +/-0.266	0.8	0.900 +/-0.232	1.13 +/-0.288	0.6	1.02 +/-0.255	0.762 +/-0.240	0.7	1.36 +/-0.313	1.14 +/-0.215	0.6	1.32 +/-0.310	1.40 +/-0.305	0.4

Appendix 4C-1, Table 4C1-2a
Summary of Soil Field Duplicate Results - OU-4b 2019 - 2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

Location ID Depth (ft bgs) Sample Date Sample Type		STSB-21 6-15 12/11/2019 N	STSB-21 6-15 12/11/2019 FD	RPD ¹	STSB-23 0.5-3 12/16/2019 N	STSB-23 0.5-3 12/16/2019 FD	RPD ¹	STSB-28 0-0.5 11/21/2019 N	STSB-28 0-0.5 11/21/2019 FD	RPD ¹	STSB-29 6-15 11/21/2019 N	STSB-29 6-15 11/21/2019 FD	RPD ¹	STSB-33 0.5-3 12/3/2019 N	STSB-33 0.5-3 12/3/2019 FD	RPD ¹	STSB-34 3-6 11/25/2019 N	STSB-34 3-6 11/25/2019 FD	RPD ¹
Total Metals	DQI Outliers																		
Aluminum (mg/Kg)	0%	6900	9200	29%	4600	5100	10%	7200	6800	6%	5700	5900	3%	5800	5700	2%	7900	8000	1%
Antimony (mg/Kg)	6%	0.63	< 0.31	68%	1.4	1.2	15%	< 1.4	< 1.4	NC	< 0.30	< 0.31	NC	0.57	0.46	21%	< 1.4	< 0.69	NC
Arsenic (mg/Kg)	6%	1.8	1.5	18%	2.9	2.0	37%	6.7	6.1	9%	1.4	1.3	7%	4.5	4.6	2%	5.9	6.1	3%
Barium (mg/Kg)	6%	67	80	18%	30	27	11%	57	35	48%	39	36	8%	31	28	10%	42	48	13%
Beryllium (mg/Kg)	6%	0.25	0.36	36%	< 0.15	< 0.16	NC	0.23	< 0.16	36%	< 0.17	< 0.17	NC	< 0.16	< 0.16	NC	0.17	0.17	0%
Boron (mg/Kg)	0%	< 2.9	< 2.8	NC	< 2.5	< 2.6	NC	< 2.7	< 2.7	NC	< 2.8	< 2.8	NC	< 2.6	< 2.6	NC	< 2.6	< 2.6	NC
Cadmium (mg/Kg)	0%	< 0.29	< 0.28	NC	< 0.25	< 0.26	NC	< 0.27	< 0.27	NC	< 0.28	< 0.28	NC	< 0.26	< 0.26	NC	< 0.26	< 0.26	NC
Calcium (mg/Kg)	0%	5800	8100	33%	2700	2500	8%	3800	3700	3%	5100	5500	8%	2600	2500	4%	3600	3700	3%
Chromium (mg/Kg)	6%	6.4	13	68%	4.7	5.0	6%	5.3	4.7	12%	7.9	8.6	8%	4.7	4.4	7%	4.6	4.5	2%
Cobalt (mg/Kg)	6%	6.1	11	57%	2.3	2.4	4%	3.8	2.6	38%	4.6	4.5	2%	2.8	2.7	4%	3.0	3.7	21%
Copper (mg/Kg)	0%	850	640	28%	550	480	14%	470	450	4%	840	840	0%	530	550	4%	940	890	5%
Iron (mg/Kg)	0%	20000	20000	0%	14000	13000	7%	9800	10000	2%	11000	11000	0%	12000	12000	0%	13000	13000	0%
Lead (mg/Kg)	0%	1.5	1.7	13%	1.6	1.5	6%	2.6	2.4	8%	1.6	1.5	6%	1.7	1.7	0%	3.2	3.3	3%
Lithium (mg/Kg)	0%	6.3	6.4	2%	2.8	< 2.9	4%	< 3.0	< 3.0	NC	3.5	3.3	6%	3.1	3.3	6%	4.3	4.1	5%
Magnesium (mg/Kg)	0%	6700	9200	31%	4100	4700	14%	5600	5400	4%	5200	5400	4%	4900	4900	0%	6600	6600	0%
Manganese (mg/Kg)	6%	97	170	55%	38	42	10%	38	32	17%	65	70	7%	43	42	2%	41	43	5%
Mercury (mg/Kg)	22%	0.084	0.096	13%	0.087	0.099	13%	0.38	0.71	61%	< 0.014	0.027	88%	0.090	0.12	29%	0.12	0.14	15%
Molybdenum (mg/Kg)	17%	2.1	2.6	21%	2.1	2.1	0%	2.7	2.6	4%	1.8	1.9	5%	2.5	2.2	13%	3.5	3.6	3%
Nickel (mg/Kg)	6%	9.5	16	51%	4.9	5.3	8%	6.6	5.5	18%	8.3	8.5	2%	5.9	5.5	7%	6.9	6.7	3%
Phosphorus (mg/Kg)	0%	850	960	12%	590	610	3%	430	360	18%	590	580	2%	520	470	10%	390	440	12%
Potassium (mg/Kg)	11%	1500	2600	54%	1100	1000	10%	1200	680	55%	1400	1300	7%	840	750	11%	1200	1300	8%
Selenium (mg/Kg)	11%	2.5	2.5	0%	2.7	1.6	51%	4.7	4.2	11%	1.9	1.7	11%	3.4	2.6	27%	4.0	3.3	19%
Silver (mg/Kg)	0%	0.13	< 0.11	NC	0.13	0.12	8%	0.13	0.12	8%	0.12	< 0.11	9%	< 0.10	< 0.10	NC	0.2	< 0.11	58%
Sodium (mg/Kg)	0%	90	120	29%	38	< 33	NC	89	100	12%	83	82	1%	53	45	16%	51	63	21%
Strontium (mg/Kg)	17%	22	34	43%	42	30	33%	96	71	30%	34	37	8%	46	44	4%	81	67	19%
Thallium (mg/Kg)	0%	< 0.29	< 0.28	NC	< 0.25	< 0.26	NC	< 0.27	< 0.27	NC	< 0.28	< 0.28	NC	< 0.26	< 0.26	NC	< 0.26	< 0.26	NC
Thorium (mg/Kg)	11%	9.6	6.9	33%	6.8	6.8	0%	3.5	4.0	13%	7.4	7.8	5%	5.9	6.4	8%	4.7	5.1	8%
Tin (mg/Kg)	0%	< 5.7	< 5.7	NC	< 5.1	< 5.2	NC	< 5.3	< 5.4	NC	< 5.5	< 5.7	NC	< 5.2	< 5.2	NC	< 5.2	< 5.3	NC
Titanium (mg/Kg)	6%	360	660	59%	300	290	3%	450	390	14%	380	430	12%	370	360	3%	440	430	2%
Uranium (mg/Kg)	22%	4.2	2	71%	1.1	1.1	0%	4.2	2.6	47%	1.9	2.1	10%	1.5	1.6	6%	1.1	1.2	9%
Vanadium (mg/Kg)	0%	23	32	33%	17	16	6%	20	17	16%	16	17	6%	18	17	6%	24	25	4%
Zinc (mg/Kg)	6%	19	30	45%	9.6	9.5	1%	9	7.3	21%	13	13	0%	8.9	8.3	7%	11	11	0%
Radionuclides																			
Radium-226 (pCi/g)	0%	1.31 +/-0.276	1.49 +/-0.366	0.4	1.06 +/-0.197	1.36 +/-0.280	0.9	1.93 +/-0.295	1.77 +/-0.315	0.4	1.79 +/-0.404	1.66 +/-0.328	0.2	1.60 +/-0.260	1.58 +/-0.288	0.1	1.90 +/-0.298	2.15 +/-0.362	0.5
Radium-228 (pCi/g)	0%	1.32 +/-0.378	1.17 +/-0.448	0.3	1.20 +/-0.231	1.02 +/-0.281	0.5	0.863 +/-0.242	0.807 +/-0.262	0.2	1.33 +/-0.371	1.42 +/-0.271	0.2	1.05 +/-0.222	0.820 +/-0.371	0.5	0.863 +/-0.184	0.982 +/-0.263	0.1

Note(s)

1. RPD or RER calculated using equations presented in the QAPP when at least one reported result in the duplicate pair is greater than the detection limit.
2. Calculated values not meeting precision criteria (DQI) in the QAPP for applicable parameters are shown in bold font.

Abbreviation(s)

- % = percent
- < = less than
- DQI = data quality indicator
- FD = field duplicate sample
- mg/Kg = milligram per kilogram
- N = normal (primary) sample
- NC = not calculated
- OU = operable unit
- pCi/g = picocurie per gram
- QAPP = quality assurance project plan
- RER = replicate error ratio
- RPD = relative percent difference

Appendix 4C-1, Table 4C1-2b
Summary of MWMP Field Duplicate Results - OU-4b 2019-2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

	Location ID Sample Depth (ft bgs) Sample Date Sample Type	STS-02	STS-02		STS-06	STS-06		STS-07	STS-07		STS-11	STS-11		STS-12	STS-12		STS-18	STS-18		STS-21	STS-21	
		6-15	6-15		0.5-3	0.5-3		0.5-3	0.5-3		0.5-3	0.5-3		6-15	6-15		6-15	6-15		6-15	6-15	
		12/17/2019	12/17/2019		12/5/2019	12/5/2019		1/8/2020	1/8/2020		12/18/2019	12/18/2019		1/8/2020	1/8/2020		1/7/2020	1/7/2020		12/11/2019	12/11/2019	
		N	FD	RPD ¹	N	FD	RPD ¹	N	FD	RPD ¹	N	FD	RPD ¹	N	FD	RPD ¹	N	FD	RPD ¹	N	FD	RPD ¹
MWMP Metals		<i>DQI Outliers</i>																				
Aluminum (mg/L)	0%	479	602	23%	<0.05	<0.05	NC	60	63.9	6%	29.2	30.1	3%	582	505	14%	178	142	23%	<0.1	<0.1	NC
Antimony (mg/L)	0%	<0.002	<0.002	NC	<0.0004	<0.0004	NC	<0.0008	<0.0008	NC	<0.0004	<0.0004	NC	0.0021	0.004	62%	0.0011	0.0008	32%	0.0013	0.0011	17%
Arsenic (mg/L)	10%	0.015	<0.4	NC	0.0004	0.0005	22%	0.0009	0.001	11%	0.0025	0.0026	4%	0.0443	0.063	35%	0.0066	0.006	10%	0.0008	0.0008	0%
Barium (mg/L)	0%	<0.04	<0.07	NC	0.016	0.015	6%	<0.02	<0.02	NC	<0.01	<0.01	NC	<0.021	0.021	0%	<0.007	<0.007	NC	0.02	0.02	0%
Beryllium (mg/L)	0%	0.0915	0.0875	4%	0.00008	0.00011	32%	0.0174	0.016	8%	0.00877	0.00606	37%	<0.08	0.0742	NC	<0.08	<0.08	NC	<0.0002	<0.0002	NC
Boron (mg/L)	0%	<0.2	<0.2	NC	<0.09	<0.09	NC	<0.17	<0.17	NC	<0.04	<0.11	NC	<0.19	<0.19	NC	<0.23	<0.17	NC	<0.2	<0.21	NC
Cadmium (mg/L)	0%	<0.1	0.0146	NC	0.00014	0.00023	49%	0.0042	0.0046	9%	0.00196	0.0019	3%	0.00527	0.0065	21%	0.00997	0.00951	5%	0.0006	0.0004	40%
Calcium (mg/L)	0%	519	517	0%	459	417	10%	570	535	6%	555	567	2%	579	564	3%	426	435	2%	444	362	20%
Chromium (mg/L)	10%	0.012	0.032	91%	<0.0005	<0.0005	NC	0.011	0.012	9%	<0.3	<0.3	NC	0.511	0.633	21%	0.0372	0.0248	40%	<0.001	<0.001	NC
Cobalt (mg/L)	10%	1.36	1.99	38%	0.0102	0.0196	63%	0.21	0.22	5%	0.111	0.123	10%	1.1	0.868	24%	1.22	1.09	11%	0.0356	0.0246	37%
Copper (mg/L)	20%	542	693	24%	0.055	0.393	151%	88.9	94.5	6%	144	168	15%	755	532	35%	338	292	15%	0.11	0.074	39%
Iron (mg/L)	10%	0.6	1.7	96%	0.05	<0.03	NC	1.16	0.83	33%	<0.06	<0.06	NC	28.3	27.7	2%	1.22	0.98	22%	<0.06	<0.06	NC
Lead (mg/L)	10%	<0.0005	0.0006	NC	<0.0001	0.0001	0%	0.0002	0.0009	127%	0.0003	0.0006	67%	0.0011	0.002	58%	0.0007	0.0003	80%	<0.0002	<0.0002	NC
Lithium (mg/L)	20%	1.36	1.4	3%	0.076	0.044	53%	0.17	0.2	16%	0.05	0.04	22%	0.121	0.123	2%	0.197	0.106	60%	0.03	0.03	0%
Magnesium (mg/L)	0%	175	216	21%	30.5	26.5	14%	59.9	60	0%	55.6	63.3	13%	163	146	11%	193	160	19%	235	212	10%
Manganese (mg/L)	30%	10.9	20.3	60%	0.41	0.624	41%	4.55	4.89	7%	2.1	2.2	5%	9.7	7.51	25%	10.8	9.1	17%	4.5	2.5	57%
Mercury (mg/L)	0%	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC	0.0003	<0.0002	NC	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC
Molybdenum (mg/L)	0%	0.001	<0.001	0%	0.0053	0.0041	26%	<0.0004	0.0005	NC	0.0006	0.0006	0%	<0.2	0.01	NC	0.001	0.0006	50%	0.0623	0.0691	10%
Nickel (mg/L)	10%	1.65	2.1	24%	0.0103	0.0148	36%	0.226	0.25	10%	0.114	0.131	14%	0.48	0.581	19%	0.735	0.633	15%	0.0185	0.0106	54%
Phosphorus (mg/L)	0%	<0.5	10.9	NC	<0.1	<0.1	NC	2.2	2.4	9%	<0.2	<0.2	NC	43.9	46.8	6%	<0.2	<0.2	NC	<0.2	<0.2	NC
Potassium (mg/L)	10%	36	13	94%	18.4	17	8%	4.2	3.4	21%	0.9	2.1	80%	34	32.2	5%	7.8	8.1	4%	53.9	48.5	11%
Selenium (mg/L)	0%	0.0584	0.0588	1%	0.0125	0.0129	3%	0.0075	0.0079	5%	0.006	0.0066	10%	<0.1	0.019	NC	0.0408	0.036	13%	0.053	0.0473	11%
Silver (mg/L)	0%	<0.0005	<0.0005	NC	<0.0001	<0.0001	NC	<0.0002	<0.0002	NC	<0.0001	<0.0001	NC	<0.0001	<0.001	NC	<0.0005	<0.0005	NC	<0.0002	<0.0002	NC
Sodium (mg/L)	0%	26	30	14%	5.9	<5.4	NC	9.8	8.4	15%	<5.7	6.4	NC	20.2	19	6%	15.1	13.6	10%	82	80.3	2%
Strontium (mg/L)	0%	1	0.85	16%	1.58	1.35	16%	0.77	0.7	10%	0.73	0.85	15%	3.55	3.73	5%	0.433	0.478	10%	3.77	3.44	9%
Thallium (mg/L)	0%	<0.0005	<0.0005	NC	<0.0001	<0.0001	NC	0.0002	<0.0002	0%	0.0002	0.0002	0%	0.0004	<0.001	NC	0.0003	0.0003	0%	0.0003	0.0002	40%
Thorium (mg/L)	0%	0.028	0.02	33%	<0.001	<0.001	NC	<0.002	<0.002	NC	<0.001	<0.001	NC	<1	0.04	NC	0.023	0.018	24%	<0.002	<0.002	NC
Tin (mg/L)	0%	<0.2	<0.2	NC	<0.04	<0.04	NC	<0.08	<0.08	NC	<0.08	<0.08	NC	<0.04	<0.04	NC	<0.04	<0.04	NC	<0.08	<0.08	NC
Titanium (mg/L)	0%	0.05	0.09	57%	0.02	0.018	11%	<0.01	<0.01	NC	0.01	0.01	0%	0.042	0.045	7%	0.013	0.012	8%	0.03	0.02	40%
Uranium (mg/L)	10%	0.774	1.03	28%	0.004	0.0029	32%	0.736	0.837	13%	0.0808	0.0416	64%	4.6	3.98	14%	0.624	0.507	21%	0.0747	0.0579	25%
Vanadium (mg/L)	10%	<0.003	<0.003	NC	<0.0005	<0.0005	NC	<0.001	<0.03	NC	<0.0005	<0.0005	NC	0.0129	0.02	43%	0.002	<0.0005	NC	<0.001	<0.001	NC
Zinc (mg/L)	0%	2.07	2.91	34%	0.006	0.011	59%	0.35	0.373	6%	0.252	0.276	9%	0.895	0.98	9%	<4	<4	NC	0.008	<0.008	0%
MWMP Radionuclides																						
Radium-226 (pCi/L)	0%	1.5 +/-0.57	1.4 +/-0.62	0.17	1.3 +/-0.3	<0.71 +/-0.34	1.84	0.62 +/-0.27	0.65 +/-0.24	0.12	<0.79 +/-0.32	<0.73 +/-0.25	NC	2.1 +/-0.36	2.2 +/-0.41	0.26	0.96 +/-0.31	0.75 +/-0.25	0.75	<1.3 +/-0.44	<1 +/-0.29	NC
Radium-228 (pCi/L)	0%	<0 +/-2.5	<2.4 +/-2.6	NC	<1.4 +/-2.4	<3.9 +/-2.5	NC	<0.42 +/-2.6	<-0.19 +/-2.5	NC	<0.06 +/-2.1	<-0.19 +/-2.3	NC	16 +/-3.3	<4.7 +/-2.5	0.12	<2 +/-2.5	<0.42 +/-2.7	NC	5.6 +/-1.9	<6.8 +/-3.2	0.56
MWMP General Chemistry Parameters																						
Alkalinity as CaCO ₃ (mg/L)	0%	<2	<2	NC	45.7	28.5	46%	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	68	68.6	1%
Alkalinity, Bicarbonate as CaCO ₃ (mg/L)	0%	<2	<2	NC	45.7	28.5	46%	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	68	68.6	1%
Alkalinity, Carbonate as CaCO ₃ (mg/L)	0%	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC
Alkalinity, Hydroxide as CaCO ₃ (mg/L)	0%	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC	<2	<2	NC
Chloride (mg/L)	0%	4.8	4.9	2%	<0.5	0.6	18%	3.7	3.6	3%	0.5	0.8	46%	2.5	2	22%	9	7.9	13%	21.4	20.6	4%
Fluoride (mg/L)	0%	100	100	0%	7	6.3	11%	<10	<10	NC	5	6	18%	<200	<200	NC	40	40	0%	5	5	0%
Nitrogen, Kjeldahl (mg/L)	0%	1.5	2.4	46%	0.1	<0.1	0%	1.8	1.5	18%	2.6	1.8	36%	2	1.8	11%	1.2	1.5	22%	<0.1	<0.1	NC
Nitrogen, Nitrate as N (mg/L)	0%	<0.02	<0.02	NC	0.16	<0.02	NC	0.04	0.02	67%	0.18	0.16	12%	<0.02	<0.02	NC	0.07	0.05	33%	<0.02	<0.02	NC
Nitrogen, Nitrate/Nitrite as N (mg/L)	0%	<0.02	<0.02	NC	0.16	<0.02	NC	0.04	0.02	67%	0.18	0.16	12%	<0.02	<0.02	NC	0.07	0.05	33%	<0.02	<0.02	NC
Nitrogen, Nitrite as N (mg/L)	0%	<0.01	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC
pH (s.u.)	0%	3.6	3.																			

Appendix 4C-1, Table 4C1-2b
Summary of MWMP Field Duplicate Results - OU-4b 2019-2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

	Location ID Sample Depth (ft bgs) Sample Date Sample Type	STSB-23 0.5-3 12/16/2019 N	STSB-23 0.5-3 12/16/2019 FD		STSB-29 6-15 11/21/2019 N	STSB-29 6-15 11/21/2019 FD		STSB-33 0.5-3 12/3/2019 N	STSB-33 0.5-3 12/3/2019 FD	
				RPD ¹			RPD ¹			RPD ¹
MWMP Metals	DQI Outliers									
Aluminum (mg/L)	0%	20.9	20.9	0%	<0.1	<0.1	NC	27.5	22.5	20%
Antimony (mg/L)	0%	<0.0008	0.0004	NC	<0.0008	<0.0008	NC	<0.0008	<0.0008	NC
Arsenic (mg/L)	10%	0.0008	0.0038	130%	<0.0004	<0.0004	NC	0.0048	0.0043	11%
Barium (mg/L)	0%	0.024	<0.05	NC	0.03	0.03	0%	0.015	0.017	13%
Beryllium (mg/L)	0%	<0.08	0.00484	NC	<0.0002	<0.0002	NC	0.007	0.0052	30%
Boron (mg/L)	0%	<0.1	<0.12	NC	<0.16	<0.14	NC	<0.12	<0.12	NC
Cadmium (mg/L)	0%	0.0029	<0.03	NC	0.0006	0.0006	0%	0.0036	0.0033	9%
Calcium (mg/L)	0%	494	529	7%	492	477	3%	497	520	5%
Chromium (mg/L)	10%	0.001	0.0013	26%	<0.001	<0.001	NC	0.001	<0.001	0%
Cobalt (mg/L)	10%	0.43	0.403	6%	0.0904	0.106	16%	0.511	0.493	4%
Copper (mg/L)	20%	196	164	18%	1.16	0.396	98%	170	156	9%
Iron (mg/L)	10%	0.13	0.14	7%	<0.06	<0.06	NC	0.17	0.12	34%
Lead (mg/L)	10%	0.0019	0.0005	117%	<0.0002	0.0003	NC	0.0007	0.0005	33%
Lithium (mg/L)	20%	0.097	0.15	43%	0.11	0.08	32%	0.219	0.303	32%
Magnesium (mg/L)	0%	85.9	97.3	12%	75.3	90.4	18%	97.3	101	4%
Manganese (mg/L)	30%	3.8	3.4	11%	3.77	5.22	32%	5.3	5.1	4%
Mercury (mg/L)	0%	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC
Molybdenum (mg/L)	0%	<0.0004	0.0005	NC	0.0217	0.0167	26%	<0.0004	<0.0004	NC
Nickel (mg/L)	10%	0.228	0.211	8%	0.0354	0.0406	14%	0.314	0.3	5%
Phosphorus (mg/L)	0%	<0.2	<0.2	NC	<0.2	<0.2	NC	<0.1	<0.1	NC
Potassium (mg/L)	10%	14.8	16.5	11%	41.3	40.8	1%	6.9	7.9	14%
Selenium (mg/L)	0%	0.0722	0.0664	8%	0.0862	0.0935	8%	0.0192	0.0174	10%
Silver (mg/L)	0%	<0.0002	<0.0001	NC	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC
Sodium (mg/L)	0%	31.3	34	8%	59.3	54.1	9%	24.2	25.9	7%
Strontium (mg/L)	0%	2.5	2.84	13%	2.89	2.85	1%	0.965	1.14	17%
Thallium (mg/L)	0%	0.0003	0.0003	0%	<0.0002	<0.0002	NC	0.0003	0.0003	0%
Thorium (mg/L)	0%	<0.002	<0.001	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Tin (mg/L)	0%	<0.04	<0.08	NC	<0.08	<0.08	NC	<0.04	<0.04	NC
Titanium (mg/L)	0%	<0.005	<0.01	NC	0.07	0.06	15%	0.024	0.022	9%
Uranium (mg/L)	10%	0.0906	0.0731	21%	0.0222	0.0236	6%	0.0505	0.0361	33%
Vanadium (mg/L)	10%	<0.001	<0.0005	NC	<0.001	<0.001	NC	<0.001	<0.001	NC
Zinc (mg/L)	0%	0.403	0.343	16%	0.03	0.017	55%	0.503	0.487	3%
MWMP Radionuclides										
Radium-226 (pCi/L)	0%	<1.1 +/-0.33	1.7 +/-0.49	1.46	<1 +/-0.25	<0.99 +/-0.25	NC	1.2 +/-0.42	0.79 +/-0.36	1.05
Radium-228 (pCi/L)	0%	<3.3 +/-2.7	<0.94 +/-2.4	NC	<5.9 +/-3.1	4.2 +/-1.9	0.68	<0.64 +/-2.1	<3 +/-2.4	NC
MWMP General Chemistry Parameters										
Alkalinity as CaCO ₃ (mg/L)	0%	<2	<2	NC	54.4	59.3	9%	<2	<2	NC
Alkalinity, Bicarbonate as CaCO ₃ (mg/L)	0%	<2	<2	NC	54.4	59.3	9%	<2	<2	NC
Alkalinity, Carbonate as CaCO ₃ (mg/L)	0%	<2	<2	NC	<2	<2	NC	<2	<2	NC
Alkalinity, Hydroxide as CaCO ₃ (mg/L)	0%	<2	<2	NC	<2	<2	NC	<2	<2	NC
Chloride (mg/L)	0%	4.6	6	26%	10.2	8.9	14%	3.7	4.3	15%
Fluoride (mg/L)	0%	6	8	29%	5.1	6.4	23%	18	17	6%
Nitrogen, Kjeldahl (mg/L)	0%	0.9	0.7	25%	0.2	0.2	0%	1.3	1	26%
Nitrogen, Nitrate as N (mg/L)	0%	0.25	0.14	56%	0.03	<0.02	NC	0.41	0.35	16%
Nitrogen, Nitrate/Nitrite as N (mg/L)	0%	0.25	0.14	56%	0.03	<0.02	NC	0.41	0.35	16%
Nitrogen, Nitrite as N (mg/L)	0%	<0.01	<0.01	NC	<0.01	<0.01	NC	<0.01	<0.01	NC
pH (s.u.)	0%	4.1	4	2%	7.2	7.3	1%	4.3	4.3	0%
Sulfate (mg/L)	0%	1710	1850	8%	1460	1400	4%	2210	2110	5%
Total Dissolved Solids (mg/L)	0%	3380	3350	1%	2440	2430	0%	3390	3310	2%
WAD Cyanide (mg/L)	0%	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC

Note(s)
1. RPD or RER calculated using equations presented in the QAPP when at least one reported result in the duplicate pair is greater than the detection limit.

2. Calculated values not meeting precision criteria in the QAPP for applicable parameters are shown in bold font.

Abbreviation(s)
% = percent
< = less than
CaCO₃ = calcium carbonate
DQI = data quality indicator
FD = field duplicate sample
ft bgs = feet below ground surface
ID = identification
mg/L = milligram per liter
MWMP = meteoric water mobility procedure
N = normal (primary) sample
NC = not calculated
OU = operable unit
pCi/L = picocurie per liter
QAPP = quality assurance project plan
RER = replicate error ratio
RPD = relative percent difference
s.u. = standard units
WAD = weak acid dissociable

Appendix 4C-1, Table 4C1-3
Summary of Field and Equipment Blank Results - OU-4b 2019 - 2020
Combined OU-4b, OU-5, and OU-6 Remedial Investigation
Anaconda Copper Mine Site
Lyon County, Nevada

Location ID Sample ID Sample Date Sample Type		STSB-27 EB01 11/21/2019 EB	STSB-05 EB02 12/4/2019 EB	STSB-06 EB03 12/5/2019 EB	STSB-04 EB04 12/10/2019 EB	STSB-22 EB05 12/12/2019 EB	STSB-17 EB06 12/12/2019 EB	STSB-02 EB07 12/17/2019 EB	STSB-19 EB09 1/6/2020 EB	STSB-10 EB11 1/8/2020 EB	STSB-30 FB01 11/22/2019 FB	STSB-35 FB02 12/3/2019 FB	STSB-05 FB03 12/4/2019 FB	STSB-03 FB04 12/10/2019 FB	STSB-25 FB05 12/12/2019 FB	STSB-01 FB06 12/18/2019 FB	STSB-20 FB08 12/18/2019 FB	STSB-13 FB09 1/7/2020 FB	STSB-08 FB11 1/8/2020 FB
	Frequency of Detection																		
Total Metals																			
Aluminum (mg/L)	5%	< 0.050	0.073 J	0.15	0.057 J	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Antimony (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Barium (mg/L)	5%	< 0.50	0.68 J	1.8	0.79 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Beryllium (mg/L)	0%	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Boron (mg/L)	0%	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Cadmium (mg/L)	0%	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Calcium (mg/L)	21%	< 0.050	0.10	0.26	0.070 J	0.071 J	0.051 J	0.051 J	0.12	0.13	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.079 J	0.072 J
Chromium (mg/L)	11%	< 0.50	1.5 J	2.4	2.7	0.59 J	0.85 J	< 0.50	< 0.50	< 0.50	< 0.50	1.8 J	0.67 J	1.5 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Copper (mg/L)	32%	1.1 J	10	6.8	5.8	18	2.0	< 0.50	2.2	1.1 J	1.5 J	< 0.50	< 0.50	< 0.50	< 0.50	0.51 J	< 0.50	< 0.50	< 0.50
Iron (mg/L)	11%	< 0.050	0.10	0.20	0.094 J	0.078 J	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Lead (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.51 J	< 0.50
Lithium (mg/L)	0%	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Magnesium (mg/L)	21%	0.012 J	0.047	0.12	0.070	0.019 J	< 0.010	< 0.010	0.014 J	0.020	< 0.010	< 0.010	< 0.010	0.014 J	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Manganese (mg/L)	21%	< 0.50	2.4	5.8	3.1	< 1.5	< 1.5	< 1.5	0.66 J	0.79 J	< 0.50	< 0.50	< 0.50	< 0.50	< 1.5	< 1.5	< 1.5	1.1	< 0.50
Mercury (mg/L)	0%	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Molybdenum (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Nickel (mg/L)	0%	< 0.50	< 0.50	0.63 J	1.1 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.5 J	< 0.50	0.95 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phosphorus (mg/L)	0%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Potassium (mg/L)	0%	0.30 J	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Selenium (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Silver (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sodium (mg/L)	0%	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26
Strontium (mg/L)	0%	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Thallium (mg/L)	0%	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Thorium (mg/L)	0%	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90	< 0.90
Tin (mg/L)	0%	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Titanium (mg/L)	11%	< 0.0025	0.0026 J	0.0082	0.0071	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
Uranium (mg/L)	0%	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Vanadium (mg/L)	0%	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (mg/L)	5%	16 J	< 2.5	< 2.5	4.9 J	< 2.5	< 2.5	< 2.5	3.8 J	< 2.5	11 J	< 2.5	< 2.5	9.5 J	8.1 J	23	< 2.5	< 2.5	< 2.5

Note(s)

1. Detections above the reporting limit are shown in bold font.

Abbreviation(s)

% = percent
< = less than
EB = equipment blank
FB = field blank
ID = identification
J = estimated detection
mg/L = milligram per liter

Atlantic Richfield Company

wood.

Appendix 4C-2
2019 – 2020 OU-4b Analytical Laboratory Reports

Appendix 4C-3
2019 – 2020 OU-4b Data Validation Reports

Appendix 4C-4
2019 – 2020 OU-4b Database Export and User Guide

Appendix 4C-4: Analytical Database Export User Guide

This Analytical Database Export Users Guide has been developed to aid users of the attached export from the Environmental Data Management System (EDMS) representing the final analytical data associated with the Anaconda Copper Mine Site (Site), Lyon County, Nevada.

Database Overview

The EDMS is a relational database that can manage the large quantity and wide variety of environmental data generated at the Site. The structure of the relational database has been normalized so that each piece of information is stored only once and that data duplication and divergence are avoided. Referential integrity is strictly enforced through indexes, key fields, and relationships. Lookup tables and valid values provide consistent nomenclature of sample locations, well identifications, chemical names, units, etc. The relational database architecture provides excellent data quality and integrity, quick access and manipulation for large data files, and optimal storage space on the data server.

Site data is managed by the Environmental Quality Information System (EQulS). EQulS is a software system produced by EarthSoft, Inc., and is used to store field data and associated laboratory results from sampling locations. EQulS is widely used throughout the environmental industry and has many modules for integration into other specialist programs used for Site data such as ArcGIS.

Database Export Overview

Exports of analytical data in the EDMS are prepared following verification and validation of data generated from the related investigation or program. Beginning July 2019, data has been exported to Microsoft Excel only and no longer provided in Microsoft Access format, unless directed. This change seeks to make data more functional to users of the reported results. The Microsoft Excel export represents an updated snapshot of the primary data fields contained in the EDMS for a given date range. The export is provided as a comprehensive table of data contained in select fields from EQulS. This document describes the data fields included in the Microsoft Excel deliverable to support user understanding of database related nomenclature. In addition, working data tables have been created from queries into a cross tabulated format which may aid to support statistics or other software tools employed by users.

Database Export Table – Field Definitions

The following are explanations of the 16 fields contained in the Microsoft Excel deliverable 'DB Export' tab and will be provided in "Column ID: Field Name" format.

1. Sort Location – includes a leading 0 in certain well IDs to allow an numerically ordered sort
2. Location Name – assigned well ID
3. Sample Type – describes whether sample is a primary sample (N) or field quality control sample (FD)
 - a. N = normal environmental sample (primary sample)
 - b. FD = field duplicate sample
4. Sample Date – sample collection date
5. Zone ID – depth zone description of sample (if applicable)
6. Easting – x-coordinate of sample location
7. Northing – y-coordinate of sample location
8. Analytical Method – laboratory test method

9. Fraction – describes if test results represent exclusively the dissolved (e.g., water soluble) parameter from field filtered samples or not, most often used for metals and radionuclides.
 - a. D = dissolved parameter (field filtered)
 - b. T = total parameter (not field filtered)
 - c. N =not applicable parameter (to test method).
10. Parameter – name of analyte tested
11. Report Result – text formatted result to include symbols and qualifiers as part of the final result as shown in tables
12. Result Value – numeric formatted result excluding any related symbols or qualifiers
 - a. Detections reflect the measured concentration in the sample
 - b. Non-detects reflect the method detection limit for the sample
13. Final Qualifier – alpha character resulting from data verification and validation following the rules described in the Site-wide QAPP
 - a. J = estimated value
 - b. U = non-detect value
 - c. UJ = estimated non-detect value
 - d. R = rejected value
 - e. UR = rejected non-detect value
14. Reason Code – alpha character supporting the Final Qualifier defining the cause for qualifying the reported values to indicate bias following the rules described in the Site-wide QAPP
15. RDL – reporting detection limit (e.g., practical quantitation limit)
16. MDL – method detection limit (e.g., minimum quantitation limit)

Working Table - Field Descriptions

Three crosstab (X-Tab) data tables (worksheets) are included to format data in a location-row, parameter-column layout for easier data manipulation. These worksheets organize results by fraction (as defined in the Fraction field of the comprehensive export).

1. D Fraction X-Tab = dissolved parameter results (field filtered)
2. T Fraction X-Tab = total parameter results (not field filtered)
3. N Fraction X-Tab =not applicable parameter results (to test method).

An additional binary column field (D_parameter name) is paired with the parameter value (numeric format) column where a '0' denotes a non-detect value and a '1' denotes a detected value. The working tables represent a subset of the more comprehensive fields in the database export file and exclude any rejected data results which are deemed invalid and not useable.